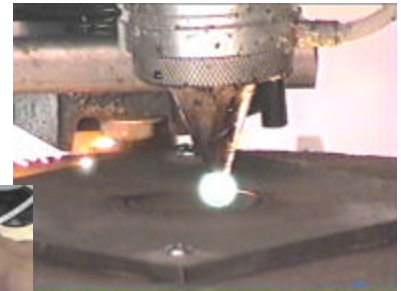




Laser Cutting of Cell Liners

The Challenge

The 324 Building, located at the Hanford Site is being deactivated to meet state and federal clean up commitments. The 324 Building B-Cell is a large hot cell that was used for high-radiation, high-contamination chemical process development and demonstrations. This hot cell was constructed with concrete walls and a stainless steel liner. The cell is contaminated with high dose radionuclides from the previous activities. Contamination may also have worked into the gap between the cell liner and the concrete walls. During the decontamination and decommissioning (D&D) of the hot cell, removal of the cell liner may be required to complete B-Cell cleanup activities.



Above: Nd:YAG laser cutting 1/4-inch stainless steel plate with concrete backing. Left: Resulting circular cut.

Current Approach

The current approach for B-Cell clean up is to deploy a remote/robotic work platform possessing full access capability within B-Cell. The Platform will be the deployment mechanism for commercially available off-the-shelf tools and future end effectors. The tools or methods to perform liner removal have not been identified. Currently used size reduction tooling and techniques (such as saws, characterization tools, high-pressure water jets, and plasma arc cutting) are being considered for sectioning and removal of the liner.

New Technology

A high powered Neodymium Yttrium Aluminum Garnet (Nd:YAG) laser technology is being developed under the auspices of EM-50's Accelerated Site Technology Deployment (ASTD) program for cutting apart contaminated gloveboxes and equipment. This type of laser equipment was recognized as having potential for application to cutting a cell liner.

Demonstration Description

A Nd:YAG laser unit has been loaned to the Los Alamos National Laboratory and is being used to cut Department of Defense munitions into sections for disposal. In the interest of the D&D work scope in the Hanford 324 B-Cell, this equipment was also used to

Benefits and Features

- ◆ Thinner and more accurate cuts, and less spatter than plasma arc cutting
- ◆ Less debris and particulates than saw cutting
- ◆ Controlled, minimal heat generation
- ◆ Synergy with Accelerated Site Technology Deployment (ASTD) program laser and robotic platform demonstrations
- ◆ Laser can also cut equipment for size reduction

execute a demonstration cut on a ¼" thick stainless steel plate (representing a typical cell liner) against a concrete block. The block was rotated to create a circular cutout. There was some concern that the concrete backing would cause excessive spatter or create focussing problems, therefore the demonstration was visually monitored and videotaped to observe results.

Demonstration Results

The demonstration cut proceeded smoothly, showing that a clean cut through the full thickness of the steel plate could be made. The concrete backing was only slightly ablated. While some sparking was observed, it was minimal. Essentially no spattering of the stainless steel was observed. The cut was stopped approximately halfway through the circle, then successfully restarted. Cutting rate was 3 cm/min, and applied power was 1 kW.

These results provide confidence that technology for cell liner removal based on laser cutting is available and effective. An end effector for the robotic platform arms using a laser cutting head could cut relatively precise portions of the cell

liner, with a separate robotic arm removing and packaging the pieces. In addition, the laser cutting tool could be used for a variety of cutting and size reduction applications for other equipment and piping located in hot cells and other facilities.

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